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THE WATER TABLE ON LONG ISLAND, NEW YORK, IN MARCH 1970

By

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ABSTRACT

A net-change map comparing water-table altitudes in 1951 with those in 1970 shows a maximum rise of about 30 feet in Kings County and a maximum decline of about 30 feet in Queens County during this period. In northern Nassau County, net declines generally ranged from 5 to 20 feet. The net change in the water table in virtually all Suffolk County from 1951 to 1970 was less than plus-or-minus 5 feet.

INTRODUCTION

The underlying ground-water reservoir is the sole source of the public water supply for most of Long Island. In 1969, about 320 mgd (million gallons per day) was withdrawn from the ground-water reservoir through public water-supply wells; additional water was withdrawn for industrial and agricultural purposes. Because of the importance of the ground-water reservoir to Long Island, the U.S. Geological Survey, in cooperation with and in addition to State and local agencies, has monitored the position of the water table by periodic measurements of water levels in wells for many years. At present (1970), the principal cooperating agencies are New York State Department of Environmental Conservation, Nassau County Department of Public Works, Suffolk County Department of Environmental Control, and Suffolk County Water Authority.

The purpose of this report is to present the results of water-table measurements in March 1970 and to compare the configuration of the water table at this time with that in previous years. The maps in this report are the first such maps published since 1951.

GEOHYDROLOGY

Geology and hydrology of Long Island are summarized in numerous reports, most notable of which are those by Veatch and others (1906), Fuller (1914), Suter and others (1949), and Cohen and others (1968). The ground-water reservoir on Long Island is contained in a thick sequence of

unconsolidated deposits underlain by bedrock. The unconsolidated deposits consist of a thick wedge of Cretaceous deposits overlain by a relatively thin layer of glacial outwash and morainal deposits of Pleistocene age. The generally highly permeable Pleistocene deposits allow about half the precipitation on the island to infiltrate into the ground and downward to the water table--the top of the zone of saturation. In some places on Long Island, perched bodies of ground water overlie the principal water table. These bodies of perched ground water are not shown on the accompanying maps nor are they discussed in this report.

PREVIOUS WATER-TABLE MAPS

Burr, Hering, and Freeman (1904) prepared the first published water-table map of most of Long Island. Other published water-table maps were prepared as follows: for 1908, by Spear (1912); for 1936, by Suter (1937); for 1943, by Jacob (1945); and for 1951, by Lusczynski and Johnson (1951). Numerous other reports give water-table maps for all or parts of individual counties on Long Island; these reports are listed in a comprehensive bibliography prepared by Cohen and others (1968). The New York State Water Resources Commission prepared unpublished maps of the water table in most of Long Island for the years 1950, 1965, and 1967; these maps are available for inspection at the office of the Department of Environmental Conservation in Westbury, N.Y.

WATER-TABLE MAP FOR 1970

Measurements in 344 wells in March 1970 were used to prepare the water-table maps in plates 1 and 2. Most wells in Nassau County were measured by the Nassau County Department of Public Works; the remainder were measured by the Geological Survey. Measurements were made by the wetted-tape method to the nearest hundredth of a foot. Additional water-level control was obtained for some areas in which no current data were available by adjusting known water levels from previous years. In most of the Island, the contours in plates 1 and 2 are probably accurate to within half a contour interval; but in places where the control is poor, as near the north shore of Suffolk County, the contours are less accurate.

The water table in Nassau and Suffolk Counties is characterized by a band of highest water levels that extends in an east-west direction somewhat north of the center of the Island. This band of highest water levels is divided into an easterly mound, which has a maximum altitude of about 60 feet in central Suffolk County, and a westerly mound, which has a maximum altitude of about 80 feet in Nassau County. Several ground-water mounds with maximum altitudes generally ranging from a few feet to 15 feet are found in the peninsulas at the eastern end of the Island. A cone of depression, whose center is a little over 15 feet below sea level, occurs in south-central Queens County.

The highest point on the water table, about 120 feet in altitude, occurs on Manhasset Neck in northwestern Nassau County. This feature, mapped by Swarzenski (1963, plate 9), was reported by him (p. 33) to have resulted from a combination of topography and zones of low permeability.

WATER-TABLE CHANGES

As shown in plate 3, the water table in 1970 differs significantly from the water table in 1951 only in the western part of Long Island. In Kings County the water table rose a maximum of about 30 feet, and in Queens County it declined a maximum of about 30 feet in this period. In virtually all the central part of Queens County, the net decline was at least 5 feet. In the northern and the central parts of Nassau County, net declines generally ranged from 5 to 20 feet. The net change in water table in virtually all Suffolk County was less than plus-or-minus 5 feet.

Hydrographs of water levels from selected wells, which indicate water-level trends in various parts of Long Island during the last 30 years or so, are shown in figures 1 and 2. Major features of the hydrographs of wells K1236, Q1252 (fig. 1), and N1104 (fig. 2) are associated with changes in the hydrologic regimen related to the activities of man. Intensive ground-water development before 1947 caused the altitude of the water table to decline below sea level throughout most of Kings County (Lusczynski, 1952; Perlmutter and Soren, 1963). The abrupt and continuous water-level rise illustrated in the hydrograph of well K1236 (fig. 1) resulted from the virtual cessation of public-supply pumping in that area in 1947. The well is near the center of a former depression in the water table. Water levels near the well rose more than 25 feet from 1947 to 1970. The water table in the area in March 1970 was about 5 feet lower than it was in 1903, when it probably reflected natural conditions in the area.

Although water levels have been declining in Queens County since the 1920's (Soren, 1971), significant water-level changes did not begin near the location of well Q1252 (fig. 1) until about 1949. Since then, the water level has declined 14 feet. This well is near the edge of a cone of depression resulting from public-supply pumpage in southern Queens County, which has averaged about 60 mgd during the past 10 years.

The water level in well N1104 (fig. 2) began to decline in about 1954 when a large sanitary-sewer program in southwestern and central Nassau County resulted in reduced recharge to the ground-water reservoir (Franke, 1968). Water levels declined at an increased rate in well N1104 in the years 1962-66 as a result of a drought (Cohen and others, 1969). The maximum water-table decline noted in this area was more than 20 feet.

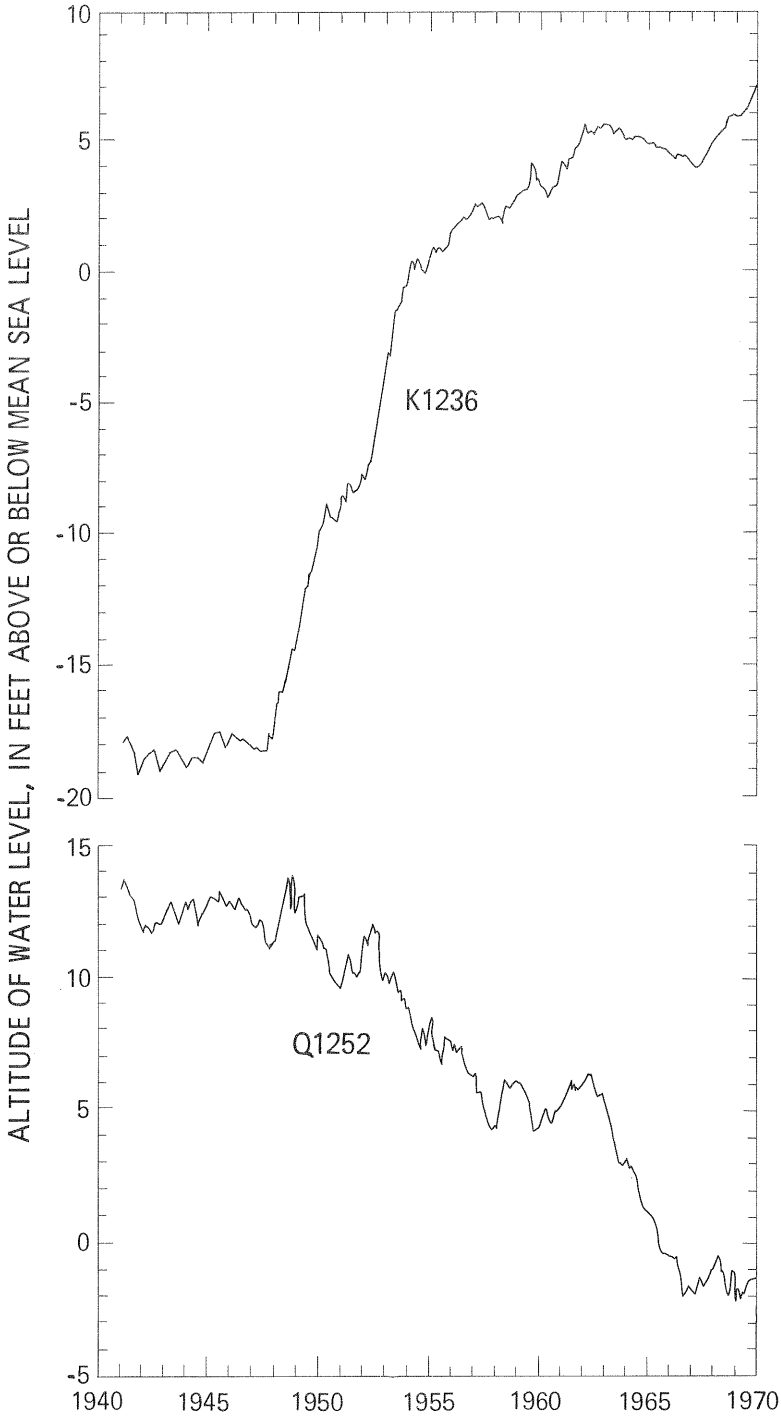

Figure 1.--Hydrographs of wells K1236 and Q1252.

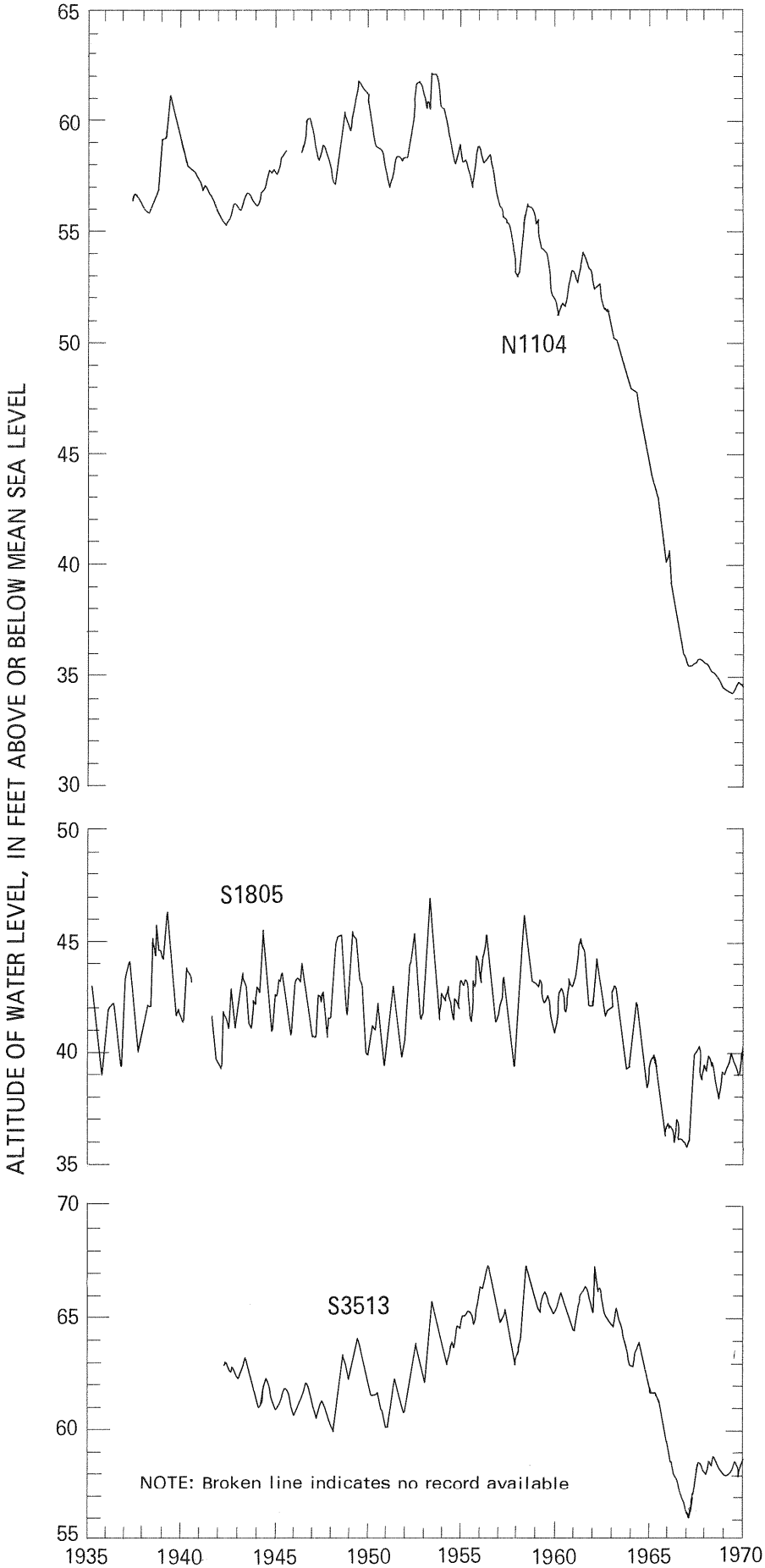

Figure 2.--Hydrographs of wells N1104, S1805, and S3513.

The hydrographs of water levels in wells S1805 and S3513 (fig. 2) in Suffolk County also show the effects of the 1962-66 drought. In those years, precipitation was below average for the longest period on Long Island since 1887 and, as a result, ground-water levels declined noticeably. All other factors being equal, the largest declines in the water table on Long Island commonly occur near the ground-water divide. Accordingly, in the drought years, the water level in well S3513, which is near the divide, declined about 9 feet. This decline is about equal to the maximum decline noted as a result of the drought (Cohen and others, 1969, p. F15). The lowest water levels in wells S1805 and S3513 occurred early in 1967, near the end of the 5-year drought. Beginning in 1967, the water level rose about 6 feet in well S1805 and about 3 feet in well S3513 as a result of increased recharge associated with generally above-average precipitation.

SUMMARY AND CONCLUSIONS

From January 1951 to March 1970, the net changes in ground-water levels in wells in Long Island were as follows: (1) Rises in water levels in Kings County generally ranged from 5 to 30 feet; (2) declines in water levels in Queens County generally ranged from 5 to 30 feet; (3) declines in water levels in Nassau County generally ranged from 5 to 25 feet; and (4) changes in water levels in Suffolk County were less than plus-or-minus 5 feet.

The increase in water levels in Kings County represents a marked increase of ground water in storage. Sufficient data are not available to characterize chemical quality of the ground water in Kings County on an areal basis. However, if or when the quality of the ground water in storage meets the standards for potability, the aquifer system in Kings County, which formerly supplied large amounts of public-supply water, may again be available for large-scale development.

The decrease in ground-water levels in Queens County has been associated with the landward movement of salty ground water (Soren, 1971). If present trends continue, ground-water levels in Queens County will probably continue to decline and salt water will continue to move inland, possibly at an accelerated rate.

The decline in ground-water levels in Nassau County has seemingly not caused as marked a landward movement of salty ground water as in Queens County (Cohen and Kimmel, 1970) mainly because (1) the aquifer system in Nassau County is considerably thicker than in Queens County and (2) ground-water levels in Nassau County have not declined as much as in Queens County; nor are they below sea level as they are in Queens County. Presumably, if present trends continue (increased pumpage, increased discharge of waste water to the sea, and decreased recharge related to the construction of impervious surfaces), ground-water levels will continue to decline in Nassau County and salty ground water will move landward, but probably at a much slower rate than in Queens County.

REFERENCES CITED

Burr, W. H., Hering, Rudolph, and Freeman, J. R., 1904, Report of the Commission on Additional Water Supply for the city of New York: New York, Martin B. Brown Co., 980 p.

Cohen, Philip, Franke, O. L., and Foxworthy, B. L., 1968, An atlas of Long Island's water resources: New York State Water Resources Comm. Bull. 62, 117 p.

Cohen, Philip, Franke, O. L., and McClymonds, N. E., 1969, Hydrologic effects of the 1962-66 drought on Long Island, New York: U.S. Geol. Survey Water-Supply Paper 1879-F, 18 p.

Cohen, Philip, and Kimmel, G. E., 1970, Status of salt-water encroachment in 1969 in southern Nassau and southeastern Queens Counties, Long Island, New York, in Geological Survey Research 1970: U.S. Geol. Survey Prof. Paper 700-D, p. D281-D286.

Franke, O. L., 1968, Double-mass-curve analysis of the effects of sewering on ground-water levels on Long Island, New York, in Geological Survey Research 1968: U.S. Geol. Survey Prof. Paper 600-B, p. B205-B209.

Fuller, M. L., 1914, The geology of Long Island, New York: U.S. Geol. Survey Prof. Paper 82, 231 p.

Jacob, C. E., 1945, The water table in the western and central parts of Long Island, New York: New York State Water Power and Control Comm. Bull. GW-12, 24 p.

Lusczynski, N. J., 1952 (1953), The recovery of ground-water levels in Brooklyn, New York, from 1947 to 1950: U.S. Geol. Survey Circ. 167, 29 p.

Lusczynski, N. J., and Johnson, A. H., 1951, The water table in Long Island, New York, in January 1951: New York State Water Power and Control Comm. Bull. GW-27, 28 p.

Perlmutter, N. M., and Soren, Julian, 1963, Effects of major water-table changes in Kings and Queens Counties, New York City, in Geological Survey Research 1962: U.S. Geol. Survey Prof. Paper 450-E, p. E136-E139.

Soren, Julian, 1971, Ground-water and geohydrologic conditions in Queens County, Long Island, New York: U.S. Geol. Survey Water-Supply Paper 2001-A, 39 p.

Spear, W. E., 1912, Long Island sources--an additional supply of water for the city of New York: New York City Board of Water Supply, 708 p.

REFERENCES (Continued)

Suter, Russell, 1937, Engineering report on the water supplies of Long Island, New York: New York State Water Power and Control Comm. Bull. GW-2, 64 p.

Suter, Russell, de Laguna, Wallace, and Perlmutter, N. M., 1949, Mapping of geologic formations and aquifers of Long Island, New York: New York State Water Power and Control Comm. Bull. GW-18, 212 p.

Swarzenski, W. V., 1963, Hydrogeology of northwestern Nassau and northeastern Queens Counties, Long Island, New York: U.S. Geol. Survey Water-Supply Paper 1657, 90 p.

Veatch, A. C., Slichter, C. S. Bowman, Isiah, Crosby, W. O., and Horton, R. E., 1906, Underground water resources of Long Island, New York: U.S. Geol. Survey Prof. Paper 44, 394 p.